PATENT SPECIFICATION (11) 1 522 295

1 522 295

(21) Application No. 25262/77 (22) Filed 16 Jun. 1977 (19)

(31) Convention Application No. 1400/76 (32) Filed 28 Jun. 1976 in

(33) Ireland (IE)

(44) Complete Specification Published 23 Aug. 1978

(51) INT CL² F16K 21/00

(52) Index at acceptance
F2V D17 E3B2 E5C

(72) Inventor: Raymond Clifford Smith

(54) BEER TAP

(71) We, JAMES J. MURPHY & CO. LIMITED, a company of the Irish Republic, of 58 Leitrim Street, Cork, Ireland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:–

The present invention relates to a flow control valve for dispensing beverages containing gas in solution from a pressurised system, such flow control valves are often called taps.

It is the practice to store draught beers such as ales and stouts in pressurised casks using a gas, such as carbon dioxide, as the pressure medium. This avoids problems of deterioration and acetification which will be caused by the contact of air.

There are however certain problems with the dispensing of ales and particularly stout from pressurised vessels. The major problem is to obtain a suitable 'head' that is to say a sufficient volume of froth on the top of the beverage after the beverage has been dispensed and the major portion of the gas in suspension have had time to settle out from the beverage. It is also important that such a head be of consistent quality and that it remains during the process of drinking whether the beverage is taken quickly or slowly. In other words the head must remain on the top of the beverage for some time.

In Irish Patent Specification No. 24124 there is provided means for dispensing at substantially constant pressure, beverages which contain gas in solution comprising in combination a pressurised container: means for feeding the liquor from the container through a delivery passage to an outlet: a two/position on/off tap for starting and stopping flow through said delivery passage, and a constriction located in the delivery passage (such a constriction being a reduction in the cross-sectional area of the delivery passage relative to the normal cross-sectional area of the pipe work) and constituted by one or more apertures of fixed size in use, the length of the constriction in the direction of flow of the liquor being so short as to produce a sudden drop in pressure, the maximum distance across any part of the constriction normal to the flow of the liquor being such as to produce a fine bubble size in the liquor and the aggregate cross-sectional area of the constriction between such as to permit reasonable throughflow for dispensing purposes, and there being when the tap is open no constriction in the delivery passage downstream of the constriction which is of less aggregate area than the aggregate area of the apertures in the constriction, the combination being such that upon the tap being opened and flow taking place through the constriction, the pressure on the liquor downstream of the constriction is immediately reduced and the liquor thereafter proceeds down the delivery passage to the outlet at substantially atmospheric pressure the sudden pressure drop occasioned by the passage through the plate releasing gas in solution from the liquor, so that a homogeneous fine and regular head is formed when the liquor is dispensed into a glass. A particularly suitable form of primary constriction as described in this Irish Patent Specification No. 24124 comprises a perforated disc having a number of apertures of fixed size – conveniently round holes – the disc being removably mounted in the delivery passage so that the disc, having an appropriate aperture size and giving an appropriate flow rate, may be selected and used according to variations in gas pressure, temperature and other dispensing conditions.

There are certain disadvantages with such a constuction of flow control valve. The main disadvantage is that it is rather difficult to ensure that the valve operates positively, that it is sufficiently sealed and that an ade-

quate flow rate is achieved. The present invention is directed towards providing an improved construction of such a valve.

According to the invention there is provided a flow control valve for dispensing beverages containing gas in solution from a pressurised system, including:

a tubular valve housing having a downstream bearing surface and an upstream bearing surface;

a downstream plunger within the housing, the plunger having a hollow body portion and an end cap engageable with the downstream bearing surface, to close the downstream end of the housing, the downstream plunger having an external cross-sectional shape relative to the internal cross-sectional shape of the bore of the housing such as to form a downstream passageway to permit the flow of liquid therethrough, the body portion having a plurality of circumferentially arranged radial holes communicating between the interior of the body portion and the passageway;

a hollow inner plunger of substantially tubular shape engageable with the upstream bearing surface and projecting into the hollow body portion of the downstream plunger, the inner plunger having an external cross-sectional shape relative to the internal bore of the housing such as to form an upstream passageway to permit the flow of liquid therethrough; and

means for moving the downstream plunger to a first position whereby engagement of the end cap on the downstream bearing surface is broken and liquid is permitted to flow through the inner plunger, into the hollow body portion, through the radial holes, into the downstream passageway and out of the valve, and for moving the downstream plunger further away from the downstream bearing surface into a second position to engage the inner plunger causing it to move out of engagement with the upstream bearing surface, whereby liquid is permitted to flow around the exterior of the inner plunger into the upstream and downstream passageways and out of the valve.

In one embodiment of the invention the means for moving the downstream plunger is a cam operated spindle mounted within an extension of the valve and bearing against the downstream portion of the end cap, the external cross-sectional shape of the spindle relative to the internal cross-sectional shape of the extension of the valve being such as to permit the relative unrestricted flow of liquid therebetween to the cam which is arranged to provide, depending on the position relative to the spindle, restricted or unrestricted flow to an outlet tap. In this latter embodiment the cam is formed from a round bar mounted in the extension of the valve transversely to the spindle, the spindle engaging cam surface being formed by a cut-out slot, forming in cross-section a segment of a circle, a circumferential liquid passageway being cut in the bar, the cam being so arranged that when the downstream plunger is in the first position liquid flows past the spindle against the cam surface and around the circumferential passageway to the outlet tap and when the downstream plunger is in the second position liquid flows past the spindle against the cam surface to the outlet tap as well as through the circumferential passageway.

The invention will be more clearly understood from the following description of a preferred embodiment thereof given by way of example only with reference to the accompanying drawings in which:–

Figure 1 is an end partially cross-sectional view of a beer tap formed from the flow control valve of the present invention.

Figure 2 is a left-hand view of the tap of Figure 1 with portion removed.

Figure 3 is a side cross-sectional view of the tap in the off position

Figure 4 is a side cross-sectional view of the tap in the first position; and

Figure 5 is a cross-sectional view of the tap in the second position,

Referring to the drawings the flow control valve comprises a tubular housing or valve body 1 connected at its downstream end directly to an extension of the valve including a transverse cylindrical housing 2 in which is mounted a spout having an outlet 3 and an internal flow guide 4 within the outlet 3, together forming a conventional outlet tap.

An inlet pipe 5, having a coupling 6 for connection to a beer cask, is mounted on the valve body 1 by means of a clamping nut 7 which engages a threaded inlet ring 8. The threaded inlet ring 8 is provided with a lock nut 9 and engages a knurled nut 10 mounted on the cylindrical housing 1. An 0 ring 11 is mounted on the inlet pipe 5 by a support seating 12. A circular support plate 13 is mounted on the exterior of the cylindrical housing 1 between the knurled nut 10 and the threaded inlet ring 8. A bushing 14 is mounted on the cylindrical housing 1 and projects into it. The bushing 14 forms a frustro-conical upstream bearing surface 15. Longitudinal grooves 16 are cut in the exterior surface of the bushing 14 to facilitate the formation of an upstream passageway 19. A hole 17 connects each groove 16 with the interior of the bushing 14. An 0 ring 18 is mounted between the bushing 14, support plate 13 and threaded inlet ring 8.

A hollow inner plunger 20 is mounted in the housing 1 and is biased into the housing 1 by means of a spring 21. The inner plunger 20 is provided with a frustro-conical bearing surface 22 which engages the bearing sur-

face 15 of the bushing 14. The inner plunger 20 projects into a downstream plunger 25 having a hollow body portion 26 and an end cap 27 which engages a downstream bearing surface 28 on the housing 1. An 0 ring 29 is mounted on the end cap 27 to provide a seal between the end cap 27 and the downstream bearing surface 28. A pair of longitudinal grooves 30 are provided in the outer surface of the downstream plunger 25 so that the external cross-sectional shape of the downstream plunger relative to the internal cross-sectional shape of the bore of the housing 1 is such as to form a downstream passageway 31 to permit the flow of liquid therethrough. A plurality of circumferentially arranged radial holes 32 connect the interior 33 of the body portion 26 with the passageway 31 a spring 34 is mounted between the downstream plunger 25 and the bushing 14.

A spindle 40 is mounted in the housing 1 and is provided with four longitudinal grooves 41 such that its external cross-sectional shape relative to the internal cross-sectional shape of the bore of the housing 1 where it islocated is such as to permit the relatively unrestrictive flow of liquid therebetween. The spindle 40 engages the end cap 27 and projects into the transverse cylindrical housing 2 and engages a slot 50 in a cam, namely a round bar 51, forming part of the means for moving the downstream plunger 25. The bar 51 is provided with a circumferential liquid passageway 52 and a pair of grooves which contain 0 rings 53, (see Figure 1). A handle 54 is mounted on the bar 51 by a bolt 55. A pin 56 is mounted on the bar 51 and engages a slot 57 in the housing 2; the slot 57 and bar 56 control the movement of the handle 54. In operation, when the handle 54 is in the upright position as illustrated in Figure 3 the inner plunger 20 bears against the bushing 14 the frustro-conical bearing surface 22 engaging the frustro-conical upstream bearing surface 15. Thus beer cannot pass between the exterior of the inner plunger 20 and the bushing 14. Similarly the end cap 27 bears against the downstream bearing surface 28 preventing any liquid being delivered into the groove 41.

Referring to Figure 4 when the handle 54 is moved into this first position the bar 51 is turned which causes the spindle 40 to be moved against the end cap 27, breaking the seal between the 0 ring 29 and the downstream bearing surface 28. It will be noted that the frustro-conical bearing surface 22 on the inner plunger 20 still engages the frusto-conical upstream bearing surface 15. There is now a passage for the beverage through the inlet pipe 5, threaded inlet ring 8, interior of the inner plunger 20 to the interior 33 of the downstream plunger 25. The beverage can then flow through the holes 32 to the downstream passageway 31 and from thence between the end cap 27 and the upstream bearing surface 28 to the grooves 41 and through the groove 41 to the slot 50 and round the liquid passageway 52 into the outlet 3 and then into the glass. It will be appreciated that the route taken by the beer and the number of constrictions to which it is subjected is such as to provide a beer with maximum 'head'.

When the handle 54 is moved to the second position illustrated in Figure 5 the bar 51 moves the spindle 40 further into the housing 1 causing the end cap 27 to move the inner plunger 20 upstream so that its frustro-conical bearing surface 22 disengages the frustro-conical upstream bearing surface 15. The beverage can now flow through the inlet pipe 5 around the exterior of the inner plunger 20 and between it and the upstream bearing surface 15, through the holes 17 to the grooves 16 and upstream passageway 19 and from hence to the grooves 30 and into the downstream passageway 31 and from thence around between the end cap 27 and the downstream bearing surface 28 and into the grooves 41. It will be noted that the beer can then travel across the slot 50 to the outlet spout 3 as well as around the bar 51. There is thus relatively no restriction on the flow and this will produce a flat beer. It will be noted that the end cap 27 seals the inner plunger 20 preventing passage of the beer through the holes 32.

The number of holes and grooves on the bushing 14 may be varied to alter the flow rate. Similarly, the 'quality' of the head may be varied by changing the number and dimenions of the holes 32. In one embodiment of the invention the holes 32 are 0.6 mm diameter holes. A possible range of hole size is 0.4 mm to 2.0 mm.

WHAT WE CLAIM IS:-

1. A flow control valve for dispensing beverages containing gas in solution from a pressurised system, including:

a tubular valve housing having a downstream bearing surface and an upstream bearing surface;

a downstream plunger within the housing, the plunger having a hollow body portion and an end cap engageable with the downstream bearing surface, to close the downstream end of the housing, the downstream plunger having an external cross-sectional shape relative to the internal cross-sectional shape of the bore of the housing such as to form a downstream passageway to permit the flow of liquid therethrough, the body portion having a plurality of circumferentially arranged radial holes communicating between the interior of the body portion and the passageway;

a hollow inner plunger of substantially tubular shape engageable with the upstream bearing surface and projecting into the hollow body portion of the downstream plunger, the inner plunger having an external cross-sectional shape relative to the internal bore of the housing such as to form an upstream passageway to permit the flow of liquid therethrough; and

means for moving the downstream plunger to a first position, whereby engagement of the end cap on the downstream bearing surface is broken and liquid is permitted to flow through the inner plunger, into the hollow body portion, through the radial holes, into the downstream passageway and out of the valve, and for moving the downstream plunger further away from the downstream bearing surface into a second position to engage the inner plunger causing it to move out of engagement with the upstream bearing surface, whereby liquid is permitted to flow around the exterior of the inner plunger into the upstream and downstream passageways and out of the valve.

2. A valve as claimed in claim 1 in which the means for moving the downstream plunger is a cam operated spindle mounted within an extension of the valve and bearing against the downstream portion of the end cap, the external cross-sectional shape of the spindle relative to the internal cross-sectional shape of the extension of the valve being such as to permit the relative unrestricted flow of liquid therebetween to the cam which is arranged to provide, depending on the position relative to the spindle restricted or unrestricted flow to an outlet tap.

3. A valve as claimed in claim 2, in which the cam is formed from a round bar mounted in the extension of the valve transversely to the spindle, the spindle engaging cam surface being formed by a cut-out slot, forming in cross-section a segment of a circle, a circumferential liquid passageway being cut in the bar, the cam being so arranged that when the downstream plunger is in the first position liquid flows past the spindle against the cam surface and around the circumferential passageway to the outlet tap and when the downstream plunger is in the second position liquid flows past the spindle against the cam surface to the outlet tap as well as through the circumferential passageway.

4. A valve as claimed in any preceding claim in which the upstream bearing surface is formed by a bushing projecting into the housing,the interior of the bushing being connected by a hole with its exterior in the housing, the diameter of the hole and the external cross-sectional shape of the bushing in the housing relative to the bore of the housing being such as to permit the relatively unrestrictive flow of the liquid therebetween.

5. A valve as claimed in claim 4 in which the upstream bearing surface is of frustroconical shape and cooperates with a similarly formed surface on the inner plunger.

6. A valve as claimed in any preceding claim in which the inner plunger is biased towards the upstream bearing surface by a spring mounted on the exterior of the inner plunger.

7. A valve as claimed in any preceding claim in which the radial holes in the downstream plunger are round and have a diameter within the range 0.4 to 2.0 mm and are symmetrically spaced around the plunger.

8. A valve as claimed in claim 7 in which the holes are 0.6 mm diameter holes.

9. A valve as claimed in any preceding claim in which the liquid passageways are formed in the plungers by longitudinally extending grooves.

10. A flow control valve for dispensing beverages substantially as described herein with reference to and as illustrated in the accompanying drawings.

F. J. CLEVELAND & COMPANY
Chartered Patent Agents
LONDON WC2A 1JQ
Agents for the Applicants

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1978.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1522295 COMPLETE SPECIFICATION
5 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

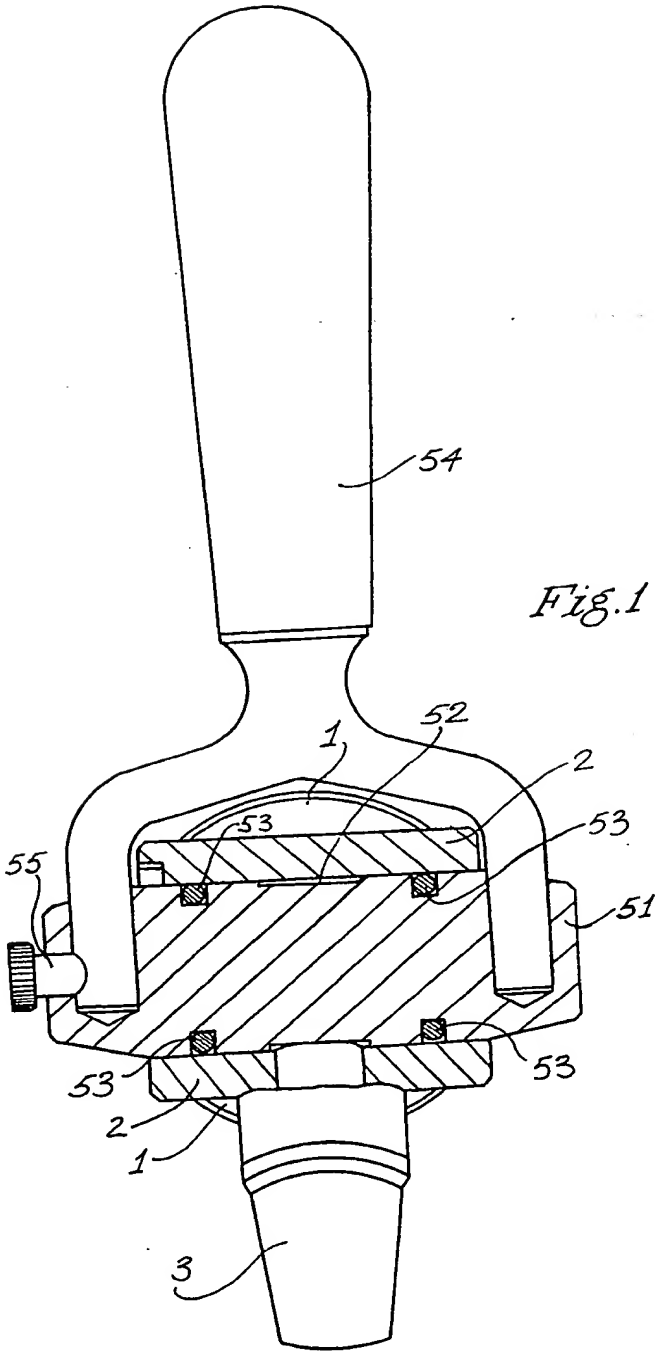
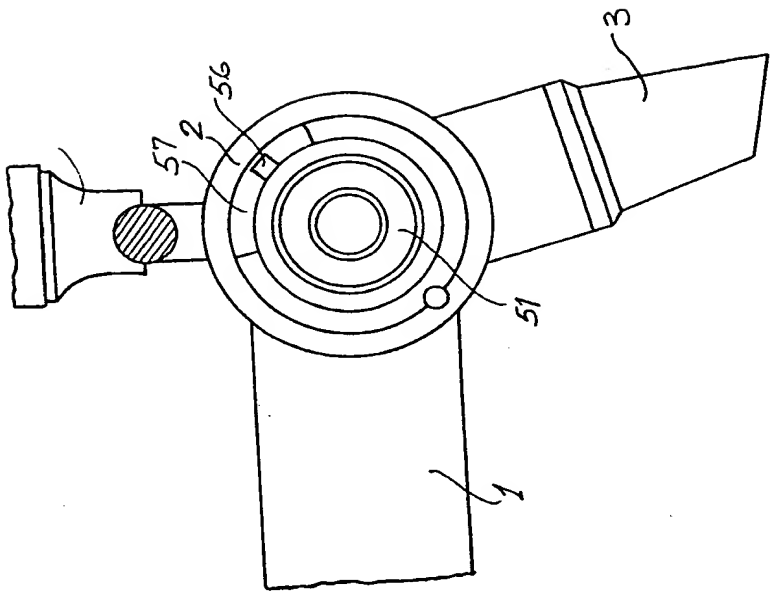


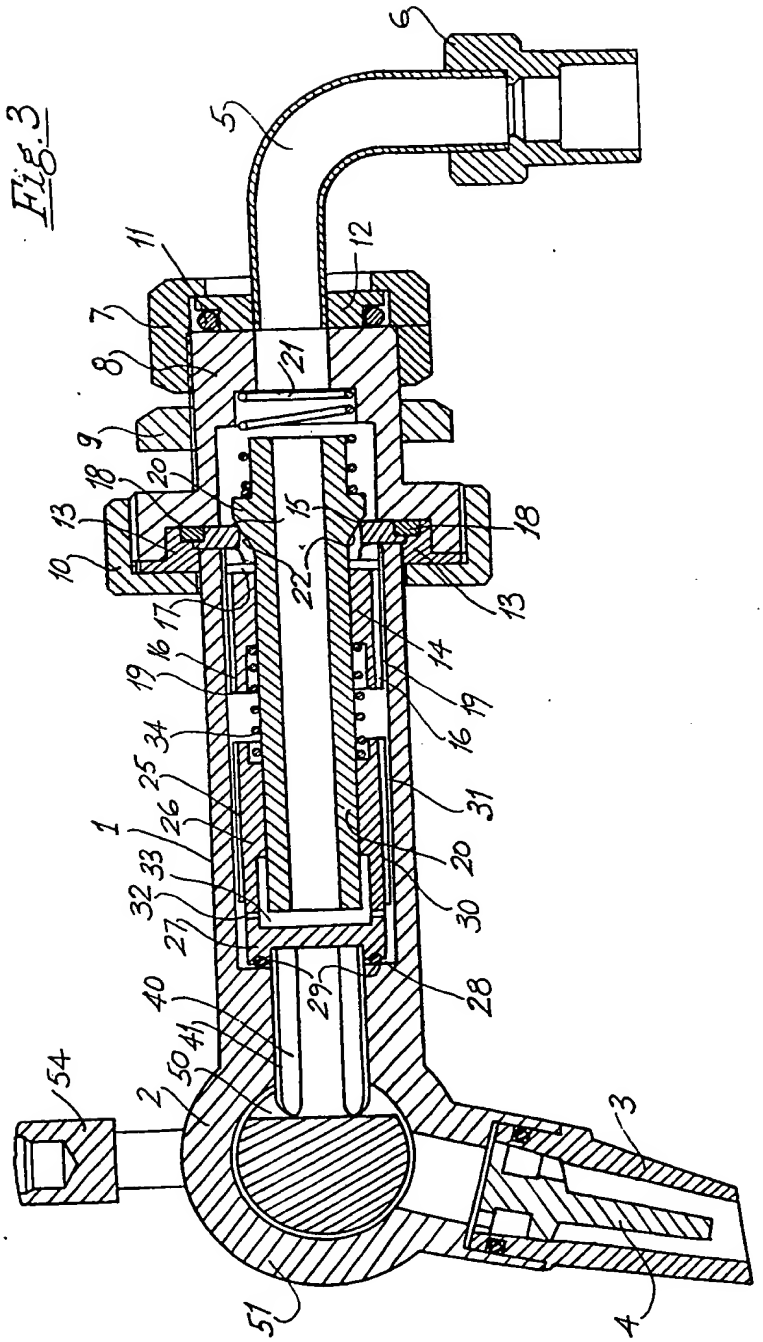
Fig.1

Fig.2



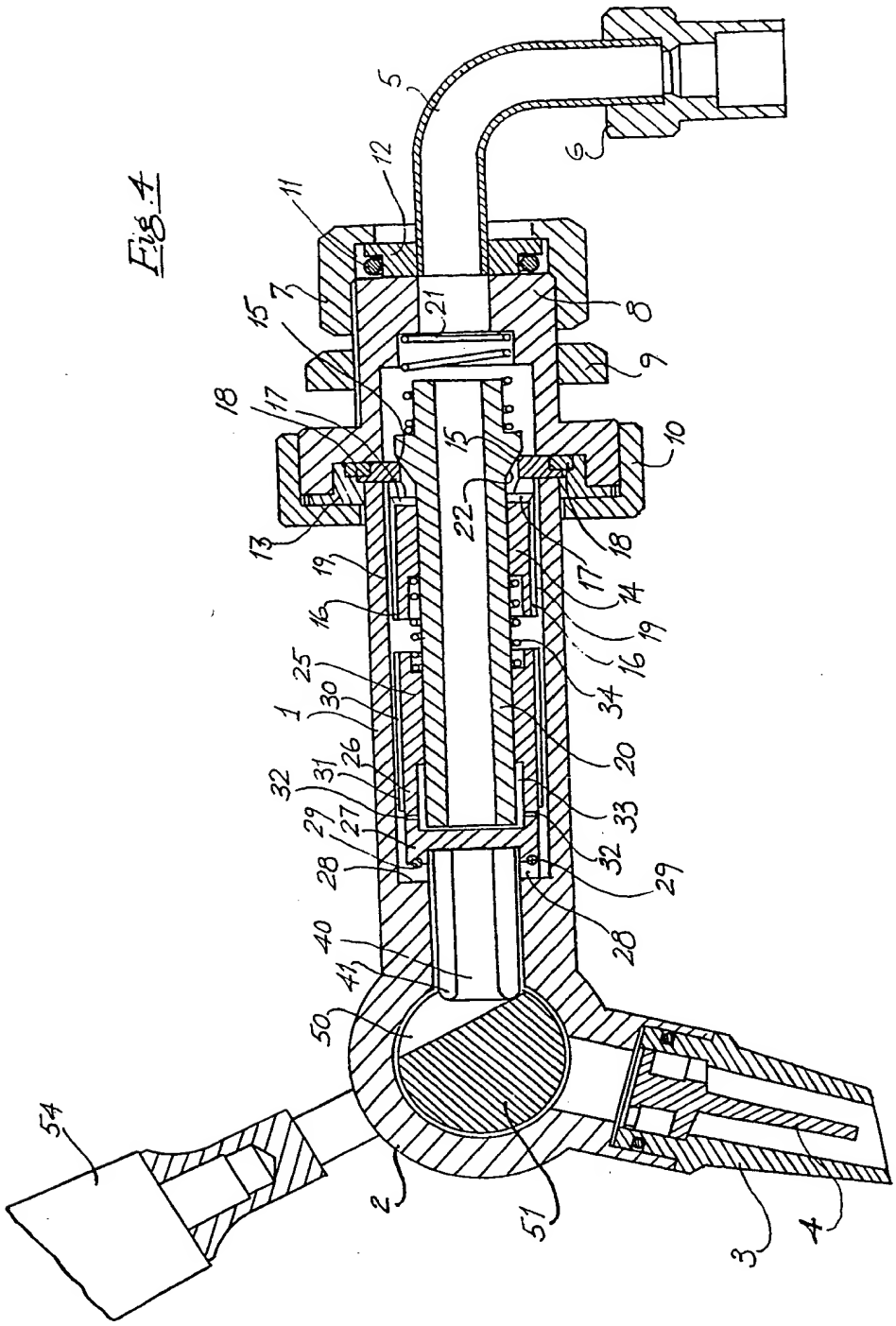
1522295 COMPLETE SPECIFICATION
5 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 3

Fig. 3



1522295 COMPLETE SPECIFICATION
5 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 4

Fig. 4



1522295 COMPLETE SPECIFICATION
5 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 5

Fig.5